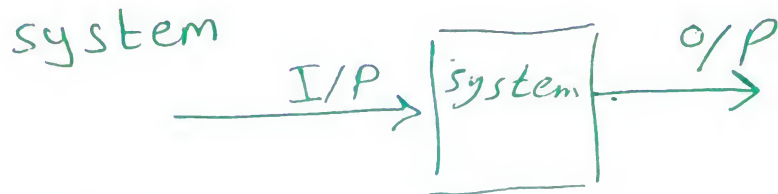


29/9/2015

Review on systems and signals :-

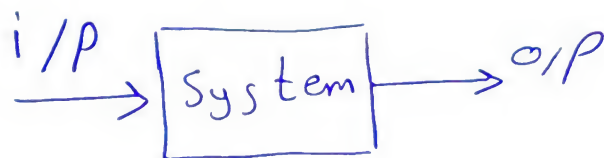


$$T.F. = \frac{O/P(s)}{I/P(s)}$$

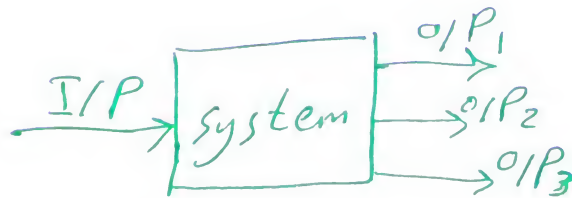
Classification of Systems

① No. of I/Ps and O/Ps

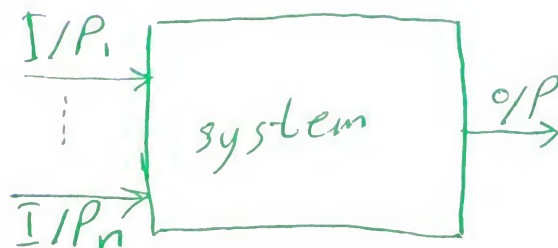
A- SISO System (Single Input single output)



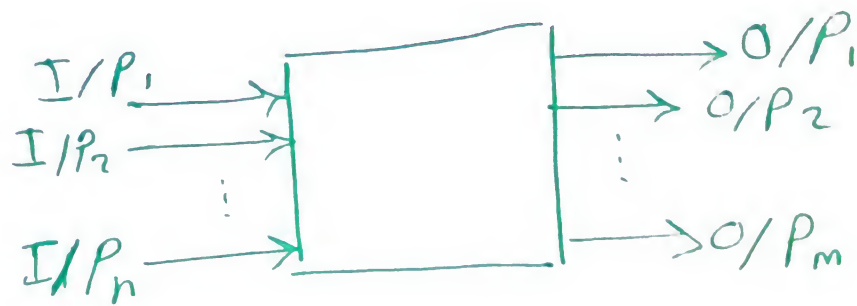
multi
↓
B- SIMO System



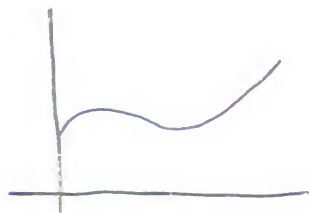
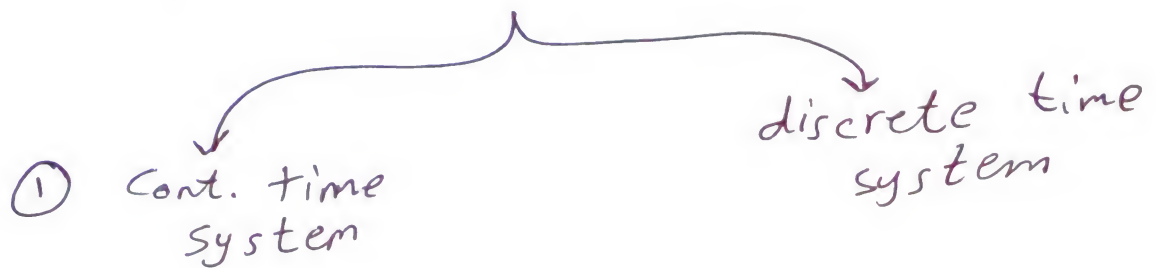
C- MISO



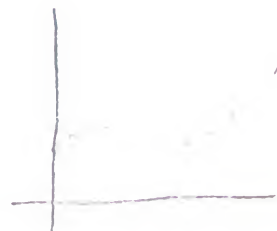
D - MIMO System



[2] Continuity of signal

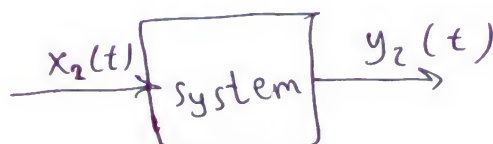
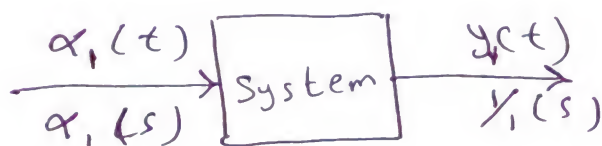
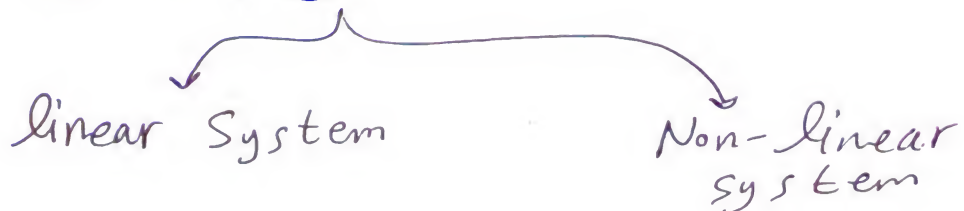


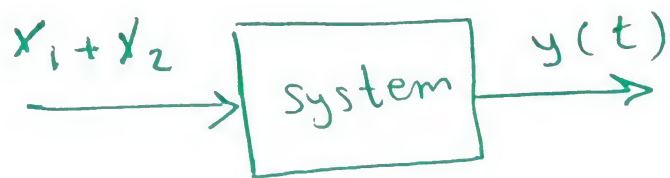
≡ Analog System



≡ Digital System

[3] linearity Property





$y(t) = y_1(t) + y_2(t) \Rightarrow$ linear System

if $y(t) \neq y_1(t) + y_2(t) =$ non-linear System

④ physical Comp.

A - electrical System

B - Mech. System

C - Electric Mech. System.

D - fluid system

A system can be in the form of:

① physical model

② Block Diagram OR signal flow graph

③ state-space equation

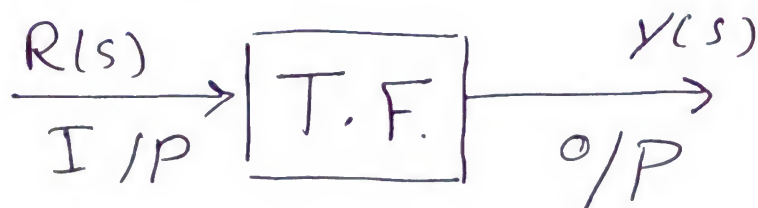
④ system equations

⑤ Transfer Function (T. F.)

\Rightarrow Turn Over

System Response

\equiv o/p in time-domain



$$T.F. = \frac{Y(s)}{R(s)} \Rightarrow Y(s) = [T.F.] R(s)$$

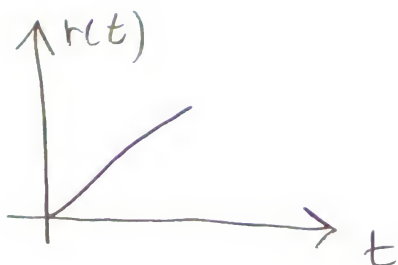
$$L^{-1}(Y(s)) = y(t) = L^{-1}[T.F. * R(s)]$$

According to the I/P

① Step Response ($r(t) = k$)

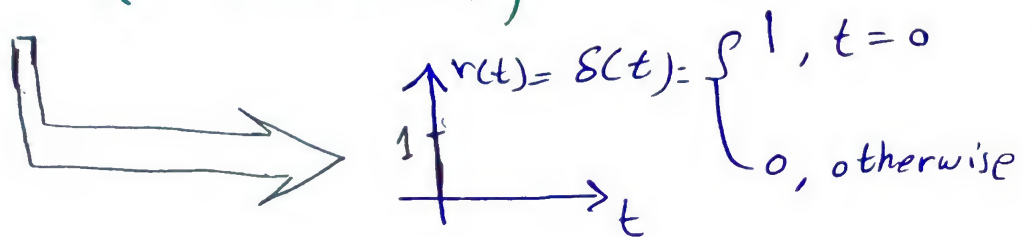


② Ramp Response ($r(t) = K(t)$)



Parabolic I/P ($r(t) = kt^2$)

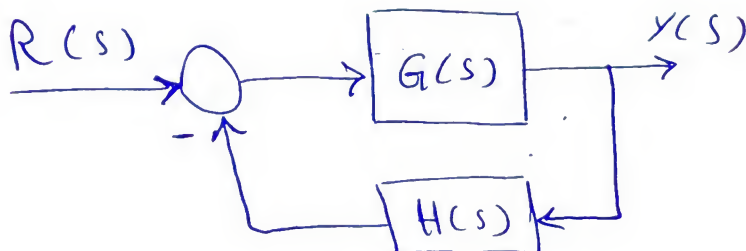
④ Impulse Response ($r(t) = \delta(t)$)



Stability

Stable \Rightarrow For bounded i/p, there exist bounded output (o/p).

Feedback System



$$T.F. = \frac{G(s)}{1 + G(s)H(s)}$$

Closed Loop T.F. = C.L.T.F. = T.F.

Open Loop T.F. = O.L.T.F. = $G(s)H(s)$

ch. eqn \Rightarrow $1 + G(s)H(s) = 0$

$$T.F. = \frac{1}{1 + G(s)H(s)}$$

Poles \Rightarrow The root of ch. eqn.

Zeros \Rightarrow The values of s that make $G(s) = 0$

⑤

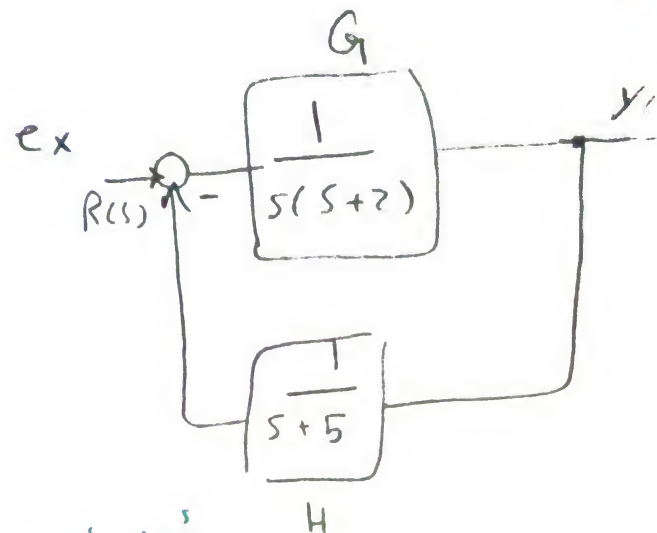
System type \Rightarrow o.l.t.f.

System order
or \sim degree

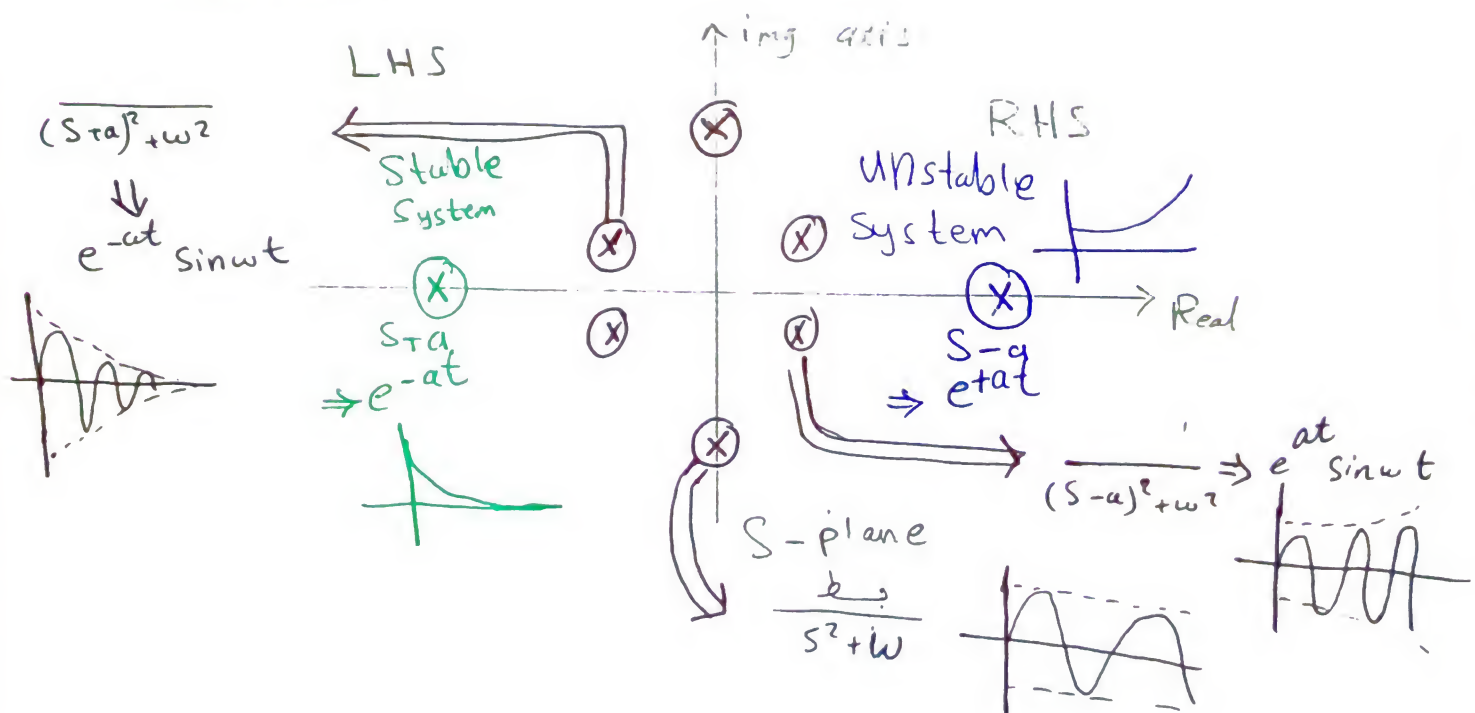
$$\text{o.l.t.f} = \frac{1}{s(s+2)(s+5)}$$

\therefore system type = 1

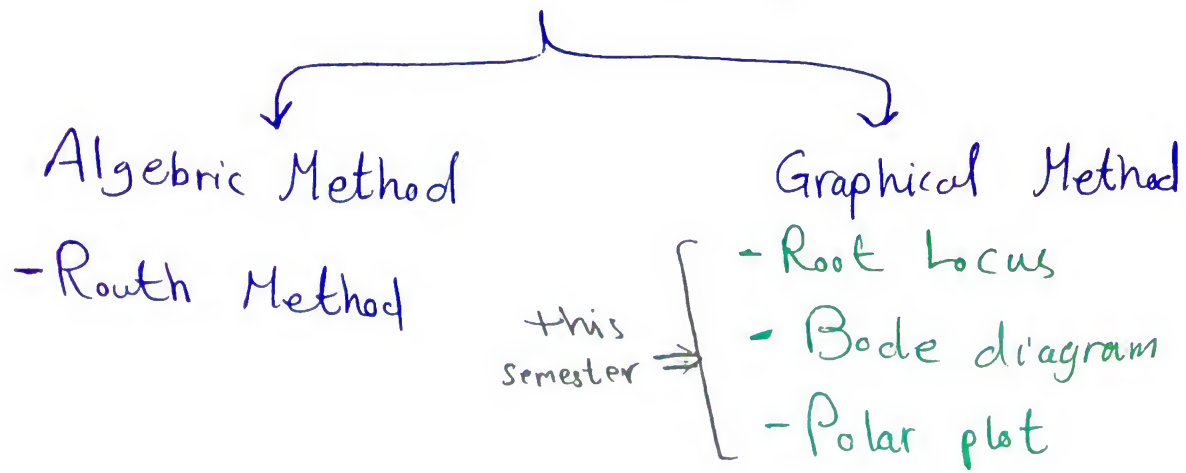
order = 3rd order — $\begin{matrix} \text{نقطتي} \\ s \end{matrix}$



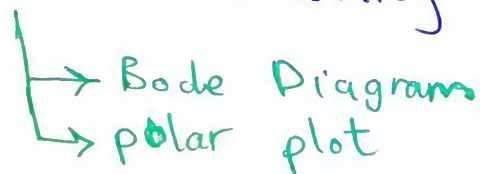
To check the system stability using the poles location.



To check the System Stability

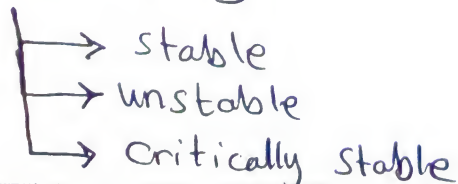


① Relative Stability



② Absolute stability

- Routh Array



1- Modern Control System

"Roland S. Burns"

2- Introduction to Control Engineering

Modeling, Analysis, Design

"Ajit K. Mandal"

3- Modern Control Engineering

"K. Ogata"

4- Feedback Control Systems

"Charles L. Phillips"

5- Modern Control Systems

"Richard C. Dorf"

6- Linear Control system Analysis and design

with Matlab "John J. D'Azzo"

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